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铲齿象一新种在甘肃省党河地区下中新统的发现[1)]

王伴月 邱占祥
(中国科学院古脊椎动物与古人类研究所 北京 100044)

摘要 记述了甘肃省党河地区的铲齿象化石一新种 ——党河铲齿象(*Platybelodon dangheensis*) 。其主要特征是:下颌联合和下门齿构成宽短的铲形;下门齿薄,由单层稀少的齿柱组成;具较大的 p3 ,p4 前窄后宽,前齿带和跟座较小,m1 构造简单,齿冠较低,第一齿脊无前斜脊,前齿带和后跟座较小。它是欧亚大陆目前所知时代最早(早中新世)、构造最原始的一种铲齿象。

关键词 甘肃省党河地区,早中新世,嵌齿象科,铲齿象
中图法分类号 Q915.878

铲齿象(*Platybelodon*) 是旧大陆所特有的象类。它的主要特点是下颌联合部和门齿伸长变宽,形成铲状,故名为铲齿象(属名的原始含义是板齿象。因为这种象的下颌骨太像一把大铁铲了,在中文中一直被译作此名,现沿用)。铲齿象主要在中中新统中发现(Borissiak,1929;Osborn and Granger,1931,1932;Osborn,1936;陈冠芳,1978;叶捷和贾航,1986;叶捷等,1989;Tobien et al.,1986),长期被看作亚洲和东欧中中新世最具代表性的标准化石(邱占祥和邱铸鼎,1990;Qiu and Qiu,1995;童永生等,1995)。在东非早中新世地层中虽也发现过铲齿象化石,但材料仅为一段门齿(Maglio,1969)。2001 年 7～8 月间,中国科学院古脊椎动物与古人类研究所、甘肃省考古所和甘肃省博物馆联合组队对甘肃省党河地区进行了野外考察,在中新统铁匠沟组的下部发现了一段铲齿象的下颌骨。材料虽少,但很重要。它带有在象类中很少发现的下前臼齿,而且是欧亚大陆时代最早(早中新世)和最原始的一类铲齿象(Wang B Y 等,待刊 a,b;Wang X M 等,待刊)。

文中所用缩写:DH 党河;IVPP V 中国科学院古脊椎动物与古人类研究所脊椎动物化石编号。

嵌齿象科 Gomphotheriidae Hay,1922

铲齿象亚科 Amebelodontinae Barbour,1927

铲齿象属 *Platybelodon* **Borissiak,1928**

党河铲齿象(新种) *Platybelodon dangheensis* **sp. nov.**

(图 1～2)

正型标本 一青年个体的下颌骨前半部,具一对门齿,左、右 p3,p4,m1 和 m2 的前端(IVPP V 13322)。

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地点和层位 甘肃省肃北蒙古族自治县西水沟 DH 199910 地点;铁匠沟组下部,早中新世。

特征 一种原始的铲齿象。下颌联合宽短;下门齿薄,由单层齿柱构成,无釉质覆盖;p3 较大,单根,有前、后附锥;p4 和 m1 副齿柱无釉柱;p4 双脊型,前脊窄,主、副齿柱刚刚分化;m1 三脊型,齿冠较低,第一齿脊位置靠前,无前斜脊,前齿带和跟座较小,跟座的二乳突大小不等,彼此紧连,并与主齿柱的后斜脊连,脊间谷宽,白垩质层薄。

名称来源 Danghe,党河流域,化石产出地区。

描述 V 13322 下颌骨因受挤压骨质破碎,布满裂纹;联合部压扁变平;左、右齿列均向舌侧倾斜。下颌每侧保存了已经出齿的 3 颗牙齿和 1 颗仍然在齿槽内的第 4 颗牙齿的前端。左侧第 2 颗牙齿的后端保留着一块几乎磨光的乳齿的残段,因此可以断定前面的两颗牙皆为恒前臼齿。按照出齿的顺序判断,这几颗牙既可以是 p3,p4,m1 和 m2 前端,也可以是 p2,p3,dp4 和 m1 的前端。遗憾的是,我们无法直接根据铲齿象类的材料对这几颗牙齿进行定位。铲齿象类关于牙齿置换的最有说服力的材料是内蒙古通古尔的 *P. grangeri* 的材料。根据 Osborn and Granger (1932) 的描述,材料中有一个尚未出生的幼崽 (foetal young) 和一个幼年 (juvenile) 的下颌骨。前者具 di2,dp2,dp3 和 dp4;后者具恒门齿 i2,dp3,dp4 和还在齿槽中的 m1。这表明,在恒门齿置换乳门齿的同时或前后,在 dp3 被置换之前,dp2 就脱落,而且不被置换,因此是没有 p2 的。但是,他们并没有记述这个种的任何下前臼齿。在同心的材料中也只有关于单独的 p4 的记载,而无 p3 的材料(叶捷和贾航,1986)。考虑到最早期的嵌齿象(*Palaeomastodon* 和 *Phiomia*)也只有 p3 和 p4,而无 p2 (Belyaeva et al.,1962),我们相信铲齿象类最多只可能有两个下前臼齿,即 p3 和 p4。因此,党河下颌骨的牙齿只可能是 p3,p4,m1 和 m2 的前端。支持这一推断的还有另外两个事实:一是在党河下颌骨第 3 颗牙齿的下方没有发现任何牙胚的痕迹,表明它不是乳齿而是恒齿;二是党河下颌上的第 1 颗牙齿在形态和大小上都很接近 *Gomphotherium connexum* 的 p3(Tobien et al.,1986,fig. 4)。

V 13322 下颌联合与 *P. grangeri* 的相似,为铲型,但较宽短;可能由于受压而在门齿后端处突然变宽,两侧缘前部彼此近于平行,上面微凹,下面稍凸。下颌骨水平支上缘脊明显。具二颏孔:前颏孔较大,位于下颌联合后缘之前,后颏孔位于 p4 前缘下方,位置较前颏孔低。

下门齿成平板状,上面微凹,下面稍凸,两侧缘稍厚于中间部分,近中缘稍厚于外缘。右门齿的外缘前端受压变形,其厚度显得比内侧的还要厚(见表 1)。前缘很薄,磨蚀面斜向前下方,在磨蚀面上可见门齿齿柱状结构,齿柱为单层,较稀少;四周由薄层的齿质层包围,门齿表面未见纵向沟纹,也无釉质层覆盖。

p3 冠面为卵圆形,长大于宽,单齿根,在齿根的舌侧面有一条浅的中沟。主尖位于齿的中部,大而钝,与前、后端以明显的沟分开。前端较小,有一小尖,后端较大,被中沟分成二小尖。p4 冠面约为前窄后宽的梯形,由两齿脊组成。前齿脊的主、副齿柱均由较钝的单个乳突(conelet)组成,彼此紧靠,仅以窄的中沟(=median sulcus *)(*见 Tobien,1973,以下同)分开。主齿柱稍大于副齿柱,前斜脊(=anterior crescentoid *)弱,与弱的前齿带相连,后斜脊(=posterior crescentoid *)较发育。后齿脊的主、副齿柱彼此分得较开,中沟较大而深。两齿柱均由双乳突组成,主乳突(=abaxial conelet *)比副乳突(=adaxial conelet *)大。

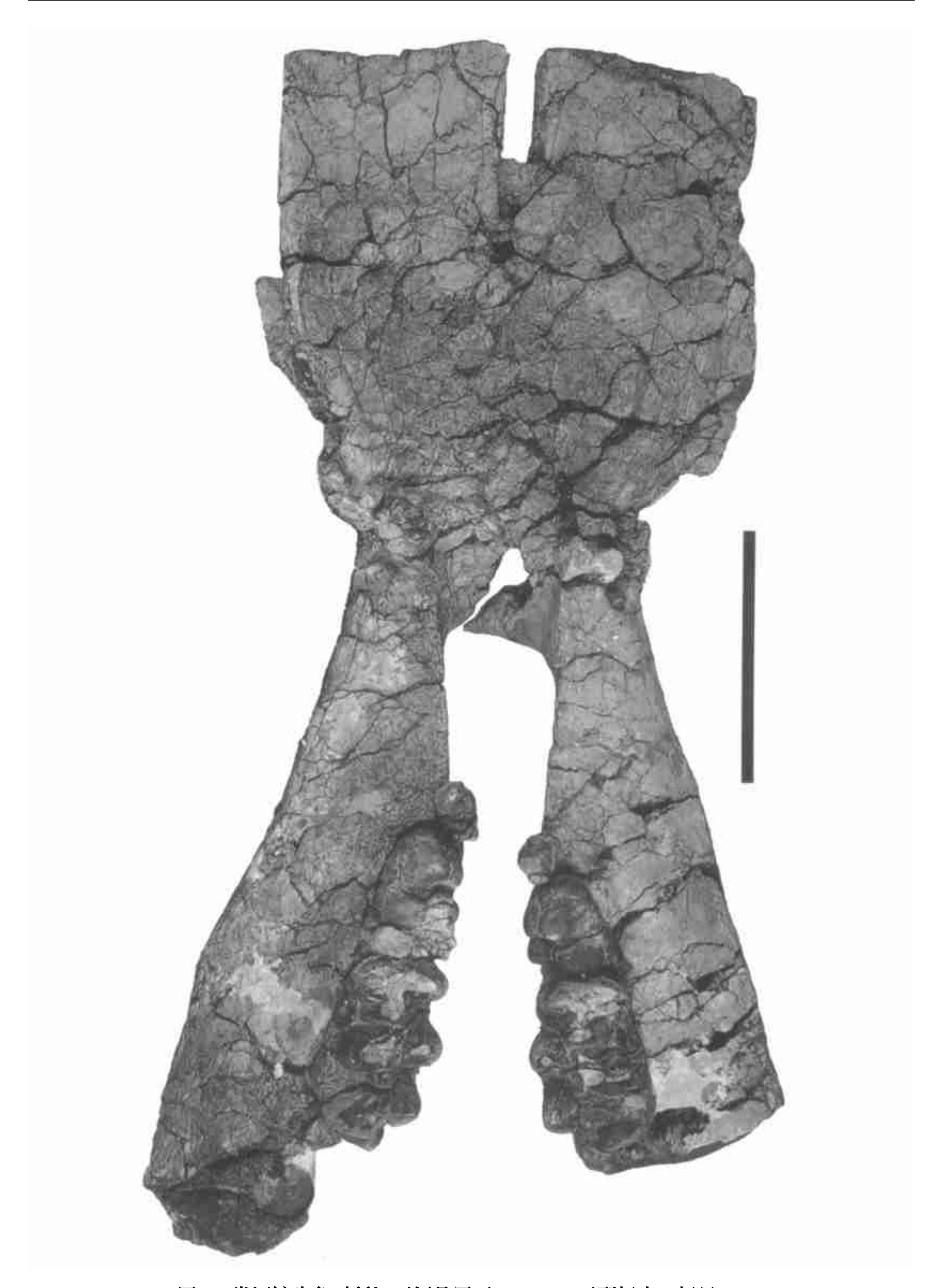


图 1　党河铲齿象(新种)下颌骨冠面(V 13322 ,**正型标本**) ,**标尺** :10cm

Fig. 1　*Platybelodon dangheensis* sp. nov. (V 13322 ,holotype) ,crown view ,scale = 10cm

主齿柱无前斜脊,但后斜脊很发达,由三个乳突组成,一直伸达齿的后缘。副齿柱与齿的纵轴垂直,前、后均无釉柱(= posttrite enamel pillars or secondary trefoids *) 。前、后齿脊间的齿谷较开阔,其舌侧开口处的齿带很弱或无,颊侧开口处的齿带较发育,谷中有弱的白垩质覆盖。

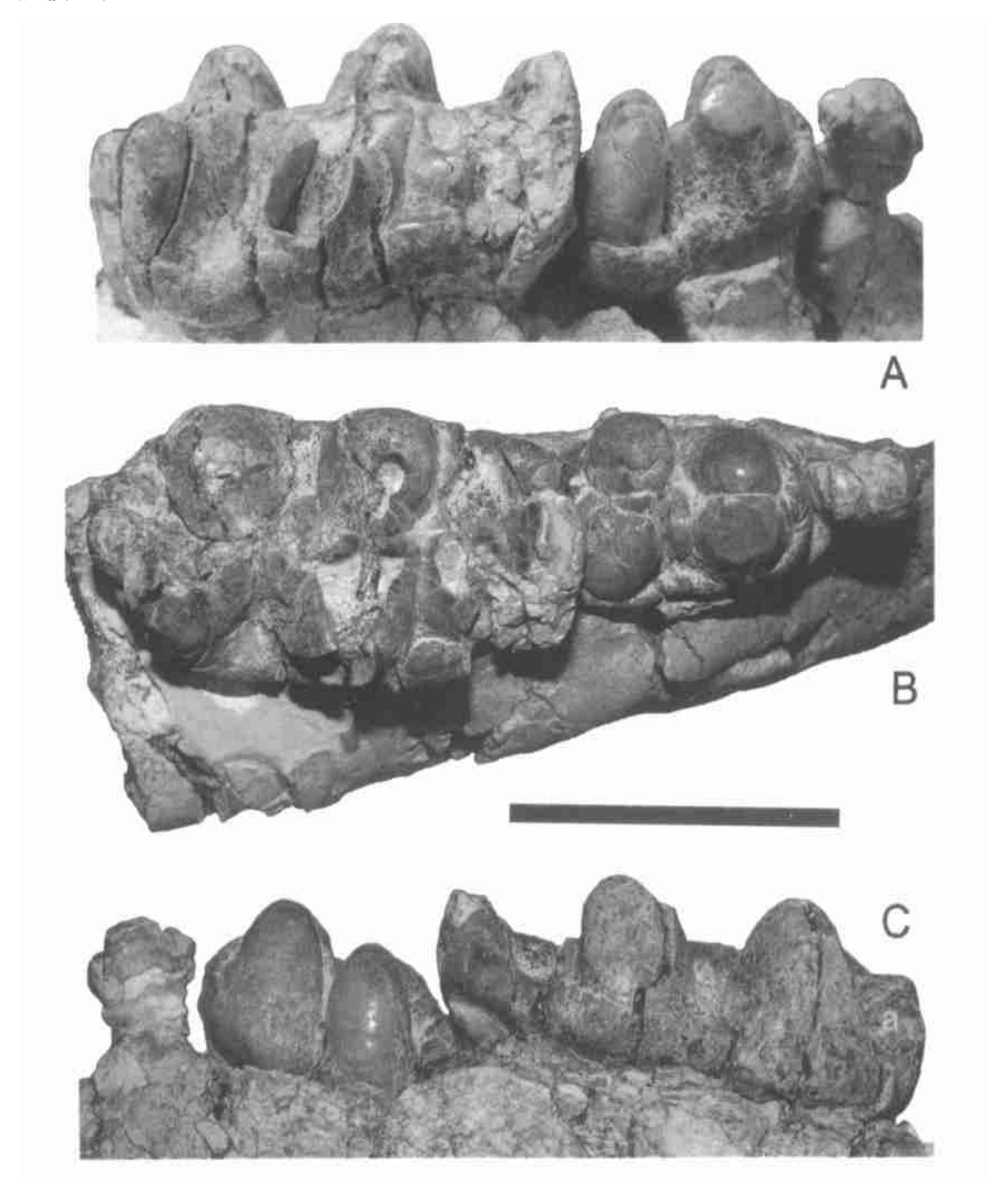


图 2 党河铲齿象(新种)右 p3 ,p4 和 m1(V 13322 ,正型标本) ,标尺:5cm

Fig. 2 Right p3 ,p4 and ml of *Platybelodon dangheensis* sp. nov. (V 13322 ,holotype) ,scale = 5cm

A. 颊侧观(buccal view) ; B. 冠面观(occlusal view) ; C. 舌侧观(lingual view)

m1 齿冠较低,具三齿脊和一跟座。主、副齿柱均较粗钝。第一齿脊位置较靠前,接近齿的前缘。该齿脊磨蚀较深,主、副齿柱和主齿柱的后斜脊已连接起来,但仍可见主齿柱的后斜脊较发达,而无明显的前斜脊。副齿柱也无前、后釉柱。第二齿脊中等磨损,主齿柱呈三叶形,后斜脊比前斜脊发达,斜脊锥较大,仍分开。副齿柱简单,仅由二乳突组成,主乳突比副乳突大,其前、后无釉柱。副齿柱稍向后外方伸,与齿的纵轴稍斜交。第三齿脊稍磨损,主齿柱由单一乳突组成,其前斜脊较后斜脊稍发育,磨蚀后呈三叶形。副齿柱也由二乳突组成,主乳突大于副乳突,但其后有微弱的釉柱雏形。副齿柱横向延伸,与齿的纵轴近于垂直。前齿带较低而窄。跟座较小,由两个彼此紧连的乳突组成,其外侧乳突较高大,与主齿柱的后斜脊连。三个齿脊之间的齿谷和跟座凹较开阔,其中有白垩质填充。齿谷的舌侧和颊侧开口处均有齿带,颊侧的比舌侧的发育。跟座颊、舌侧也有齿带。

m2 正在萌出过程中。左、右 m2 均只保存了前部,出露部分可能为第一齿脊。其主、副齿柱均由较大的主乳突和小的副乳突组成。主齿柱比副齿柱高,其前有由三个乳突组成的前斜脊。副齿柱无釉柱。测量见表 1。

表 1　铲齿象(Platybelodon) 的测量比较

Table 1　Measurements and comparison of Platybelodon　(mm)

	P. dangheensis sp. nov.		*P. danovi*	*P. grangeri*	*P. jamandzhalgensis*	*P. beliajevae*	*P. tongxinensis*
	(V 13322 ,holotype)		Borissiak , 1929	Osborn & Granger , 1931 ,1932	Beliajeva & Gabunia , 1960	Alexeeva , 1971	Chen ,1978 ; Ye et al. , 1986 ,1989
	左(left)	右(right)					
symphysis L	195		> 700	415～655e	84(ii)		195
symphysis W (maximum)	201		245	229～388			120(前端)
symphysis W (minimum)	115		130	122～165	62e(ii)		85.4
i2 L	205(i)	208(i)		360			
i2 T (median)	14.4	13.9	20～30	33			33.1
i2 T (lateral)	6.1	15 ?	15～25	25			12
i2 W	92	93	110	166			140.4
p3 L	24.4	19.1					
p3 W	15.7	13.7					
p4 L	43.7	44.1					46.5～51.8
p4 AW	26.9	26.8					
p4 PW	29.2	30.5					30～34.3
p4 Pb H	25.1	25.9					
m1 L	79.9	83.2		81e～101		108	77～78
m1 W	43	43.6		41～52		67	45.2～47
m1 Ⅲl H	30	30.5					
m1 Ⅲb H	31	32.2					
m1 W/L(%)	54	52		40～64		62	58～61

缩写(Abbreviations) :T,厚(thickness) ;L,长(length) ;W,宽(width) ;H,高(height) ;A,前齿脊(anterior lophid) ;P,后齿脊(posterior lophid) ; Ⅲb,第三齿脊颊侧(buccal side of lophid Ⅲ) ; Ⅲl,第三齿脊舌侧(lingual side of lophid Ⅲ) ; (i) ,i2 长为由 i2 前端至下颌联合最窄处的距离(distance between anterior end of i2 and the narrowest part of symphysis) ; (ii) ,乳门齿(di2) ; ?,较厚,可能由变形所至(probably due to deformation) 。

比较和讨论 党河的下颌骨的联合部和门齿呈铲形,门齿内部为齿柱状结构。这一特征仅在铲齿象属(*Platybelodon*)中出现。因此,在党河发现的下颌骨显然应归入该属。*Platybelodon* 目前已知6种:达氏铲齿象(*P. danovi* Borissiak,1928),葛氏铲齿象[*P. grangeri* (Osborn,1929)],同心铲齿象[*P. tongxinensis* (Chen,1978)],*P. jamandzhalgensis* Beliajeva et Gabunia,1960,别氏铲齿象(*P. beliajevae* Alexeeva,1971)和非洲的一个未定种 *Platybelodon* sp.。

到目前为止,还从来没有关于铲齿象p3的记载。事实上,我们不能完全肯定在铲齿象中这个牙齿确实存在(见前)。这样一来,我们只能在下颌联合、门齿、p4和m1的形态上和其他种进行比较。党河的标本和 *P. danovi*、*P. grangeri* 和 *P. tongxinensis* 的共同区别在于它的门齿的齿柱状结构简单,由单层稀少齿柱构成;m1的齿冠低,齿柱粗钝,第一齿脊的位置较靠前,缺主齿柱前斜脊,前齿带较窄小,跟座也较小,由大小不等、彼此相连的乳突组成。此外,它与 *P. danovi*、*P. tongxinensis* 和 *P. jamandzhalgensis* 的区别还在于它的下颌联合不呈长勺状;*P. danovi* 的门齿有釉质层覆盖;*P. beliajevae* 的m1要大得多。东非的 *Platybelodon* sp.的门齿已为多层齿柱结构。

由上面的比较可以看出,党河铲齿象的下门齿齿柱构造简单,还保留相当大的p3,p4的前脊比后脊窄小,主、副齿柱尚未完全分开,m1齿冠较低,冠面构造简单,白垩质层薄。从进化的角度看,这些特征都是原始特征。因此,党河的铲齿象应为该属一构造原始的新种,被称为党河铲齿象(*Platybelodon dangheensis*)。从门齿的进化程度判断,它可能比东非的 *Platybelodon* sp.还原始些。从下颌联合部和下门齿的形态(两者都很短宽)判断,党河铲齿象似乎与 *P. grangeri* 的关系更接近,而不同于具长勺状下颌联合和门齿的 *P. danovi* 和 *P. tongxinensis*。它们有可能代表两个不同的分支。不过,这还需要更多的材料予以证明。

党河铲齿象产自中新统铁匠沟组的下部。根据共生的哺乳动物群(西水哺乳动物群)和古地磁年代的分析,其时代为大约距今19～20Ma的中新世早期(Wang B Y等,待刊a,b;Wang X M等,待刊),是欧亚大陆已知时代最早和最原始的铲齿象。这一出现的时代已经非常接近象类化石在欧亚大陆首次出现的所谓的"象事件"(20～21Ma)。这使我们对铲齿象是否起源于亚洲产生了怀疑,因为很难想像,特征如此明显的铲齿象会在如此短的期间内从刚刚迁入的嵌齿象类演化出来。不能排除铲齿象在非洲产生,然后和嵌齿象类一起迁入亚洲的可能。

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A NEW SPECIES OF *PLATYBELODON* (GOMPHOTHERIIDAE, PROBOSCIDEA, MAMMALIA) FROM EARLY MIOCENE OF THE DANGHE AREA, GANSU, CHINA

WANG Ban-Yue QIU Zhan-Xiang

(*Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences* Beijing 100044)

Key words Danghe area in Gansu, early Miocene, Gomphotheriidae, *Platybelodon*

Summary

The genus *Platybelodon* has been known as one of the most characteristic fossils of the middle Miocene in Palaearctic Region. In July and August of 2001 a mandible of *Platybelodon* was unearthed from the early Miocene deposits in the Danghe area, Gansu, China. It represents the most primitive and the earliest species of *Platybelodon* so far known.

Gomphotheriidae Hay, 1922

Amebelodontinae Barbour, 1927

Platybelodon **Borissiak, 1928**

Platybelodon dangheensis **sp. nov.**

(Fig. 1～2)

Holotype Anterior part of a juvenile mandible with left and right incisors, p3, p4, ml and anterior part of m2 (IVPP V 13322).

Locality and horizon DH 199910 of Xishuigou, Subei Mongol Autonomous County, Gansu, China; early Miocene, lower part of the Tiejianggou Formation.

Diagnosis A primitive *Platybelodon*; symphysis and incisors short and wide; tusk thin, composed of single layer of dentinal rods, without enamel; p3 large, single-rooted, with anterior and posterior accessary conelets; no posttrite enamel pillars on p4 and m1; p4 bi-lophodont, anterior lophid narrower than the posterior lophid, with its abaxial and adaxial conelets hardly separated; m1 trilophodont, comparitively lower crowned, first lophid anteriorly positioned, without anterior crescentoid, anterior cingulum low and narrow, talonid small, composed of two unequally small conelets, linked with posterior crescentoid of pretrite; valleys broad, and cement thin.

Etymology Danghe River Vally is the area where the fossil was collected.

Dimension See Table 1 in Chinese text.

Comparison and discussion The lower jaw from the Danghe area (V 13322) has a shovel-shaped symphysis and incisors, composed of dentinal rods. These features are unique and diagnostic of the genus *Platybelodon*. Therefore, there is no doubt that the lower jaw from Danghe should belong to this genus.

Each of the horizontal rami contains 3 complete and an anterior part of a fourth tooth. On the left ramus a remnant of a heavily worn milk tooth remains on the top of the posterior end of the second tooth. This renders it possible to identify the first two teeth permanent ones. However, both possibilities may valid: either they are p3, p4, m1 and a part of m2; or they represent p2, p3, dp4 and a part of m1. Unfortunately, it is impossible to directly define these teeth based on comparison with the material so far known in *Platybelodon*. The best sample of *Platybelodon* is that from Tung-gur. According to Osborn and Granger (1932), there were one foetal young, with di2, dp2, dp3 and dp4,

and one juvenile ,with i2 ,dp3 ,dp4 and the m1 in alveole. This indicated that the dp2 had dropped away shortly before or after the time of replacement of the milk incisors by the permanent ones and the dp2 had no successor at all. However ,Osborn did not describe any permanent premolars. In the sample from Tongxin only p4 was described ,but no p3(vide Ye and Jia ,1986) . In consideration of the fact that even the earliest gomphotheres ,like *Palaeomastodon* and *Phiomia* ,possessed only two lower premolars ,p3 and p4(Belyaeva et al. ,1962) ,it may not be too bold to postulate that *Platybelodon* has only two lower premolars ,namely p3 and p4. To substantiate the above assumption are the two other facts :1) No remnants of milk tooth has been found under the third tooth. Therefore ,the third tooth is m1. 2) The first tooth is very similar to the p3 of *Gomphotherium connexum* figured by Tobien et al. in 1986(fig. 4 ,loc. cit) .

Platybelodon is now known to include six species : *P. danovi* Borissiak ,1928 , *P. grangeri* (Osborn ,1929) , *P. tongxinensis* (Chen ,1978) , *P. jamandzhalgensis* Beliajeva et Gabunia ,1960 , *P. beliajevae* Alexeeva ,1971 and the African *Platybelodon* sp.

Since no p3 has ever been described in any samples of *Platybelodon* ,we have to limit our comparison to the incisors ,p4 and m1. The lower jaw from the Danghe area is different from those of *P. danovi* , *P. grangeri* and *P. tongxinensis* in the following :1) Its incisors are composed of single layer of dentinal rods. 2) The occlusal pattern of its m1 is comparatively lower crowned ,with obtuse main cones ,its first lophid is more anteriorly located ,without anterior crescentoid ,anterior cingulum narrow and low ,talonid small ,with two conelets of unequal size ,merging with the posterior crescentoid of the pretrite of the third lophid. It further differs from *P. danovi* , *P. tongxinensis* ,and *P. jamandzhalgensis* in having shorter shovel-shaped symphysis instead of long and spoon-shaped ones ; from *P. danovi* in lacking enamel on the tusk. The m1 of *P. beliajevae* is much larger than that of the Danghe material. The material of *Platybelodon* sp. from Eastern Africa consists of a unique lower incisor ,which is composed of multilayered dentinal rods. The above comparison shows clearly that V 13322 represents a new species of *Platybelodon* ,here called as *Platybelodon dangheensis*. All the distinctive features of *P. dangheensis* are primitive in nature. It represents the most primitive species of *Platybelodon* so far known. Jugding from the form of its symphysis and incisors , *P. dangheensis* seems to be closer to *P. grangeri*. Whether *P. dangheensis* and *P. grangeri* represent a branch distinct from the other species of *Platybelodon* is a question pending on more material.

Platybelodon dangheensis was found from the lower part of the Tiejianggou Formation ,which is of early Miocene (19～20Ma) based on the local mammalian fauna (the Xishui Mammalian Fauna) and paleomagnetic data (Wang B Y et al. in press ,a ,b ;Wang X M et al. in press) . The occurrence is very close to the "Proboscidean event" which is generally thought occurred around 20～21Ma. This makes the previous assumption that *Platybelodon* took its origin on the Asian mainland doubtful ,since it is hard to imagine that so typical platybelodonts could have evolved from the just immigrated gomphotheres in so short time. It can not be simply ruled out that *Platybelodon* originated in Africa first and then ,together with the first gomphotheres ,migrated into Eurasia.

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